AD-A144 550 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 1/1
MILL POND DAM (CT 004.. (U) CORPS OF ENGINEERS WALTHAM
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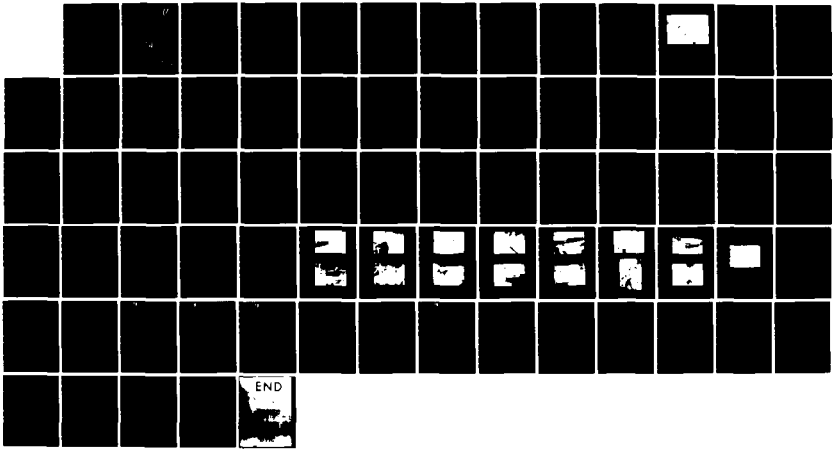
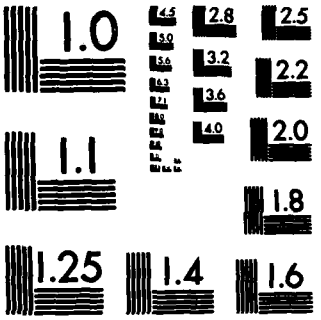


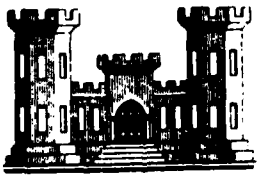


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

LOWER CONNECTICUT RIVER BASIN
ESSEX , CONNECTICUT

MILL POND DAM
CT 00423

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEER
WALTHAM , MASS. 02154

APRIL 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
Lower Connecticut River Basin
Essex, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Mill Pond Dam is 200 feet in length, with a maximum height of 18 feet. The spillway is 68 feet in length extending from the left abutment. Mill Pond Dam has a storage volume of 464 acre-feet; the size classification is thus "small." Based on the visual inspection, the Mill Pond Dam appears to be in fair condition. The dam has been classified as having a "High" hazard potential. For the combination of dam size (small) and downstream hazard (high), a range in the magnitude of the test flood of ½ PMF to PMF is given.

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MILL POND DAM

CT 00423

LOWER CONNECTICUT RIVER BASIN

ESSEX, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	CT 00423
Name of Dam:	Mill Pond Dam
Town:	Essex
County and State:	Middlesex, Connecticut
Stream:	Falls River
Date of Inspection:	1 November, 1979

BRIEF ASSESSMENT

Mill Pond Dam is 200 feet in length, with a maximum height of 18 feet. The upstream face of dam is a vertical mortared stone masonry wall partially replaced in areas with concrete. The downstream face of the dam is a concrete wall approximately 12 feet in height and 4 feet wide. The remains of a factory foundation occupy the irregular shaped dam crest, 30 to 60 feet wide. The composition of the fill material is unknown.

The spillway is 68 feet in length extending from the left abutment. The original construction of the spillway was stone masonry. A concrete surface has been added to the spillway, forming a curvilinear downstream face. The outlet works consist of an intake structure (two-2 feet wide by 4 feet deep sluicegates), penstock, turbine chamber, and a tailrace.

The dam was originally constructed to provide water power for a mill and is presently being restored to provide low head hydropower to the owner. Mill Pond Dam has a storage volume of 464 acre-feet; the size classification is thus "small." The areas of probable dam failure impact include several residential homes along Middlesex Turnpike (Route 9A) and two commercial establishments adjacent to the river below this roadway. The dam failure analysis indicates that approximately three inhabitable structures would be flooded with water to a depth of greater than 2 feet. In addition, economic loss may be extensive to the Middlesex Turnpike located 1,000 feet downstream of the dam. With the possibility of the loss of more than a few lives and the probability of excessive economic losses, the dam has been classified as having a "high" hazard potential.

Based on the visual inspection, the Mill Pond Dam appears to be in fair condition. Some settlement and cracking of the floor slab at the crest of the dam has occurred. The downstream concrete

face appears to be in good condition. Downstream from the concrete portion of the dam a nearly level grassed area was observed. The grassed area indicated no visible seepage and was in generally good condition. The visible face of the spillway is in fair condition. A portion of the right spillway training wall had collapsed for a distance of approximately 18 feet. Most of the stone masonry blocks have been removed in this section and the embankment has been eroded back for a distance of apprxoimately 8 feet. A cast iron drainage pipe is located adjacent to the end of the concrete training wall in this collapsed section. Other portions of the existing wall have been undermined causing masonry blocks to be removed. The outlet structure service gates have recently been replaced and are in good condition.

For the combination of dam size (small) and downstream hazard (high), a range in the magnitude of the test flood of ½ PMF to PMF is given. A test flood of ½ PMF was selected for this project. The maximum spillway capacity without dam overtopping is 1,223 CFS. The capacity of the spillway is inadequate to pass the ½ PMF test flood outflow of 8,070 CFS and would overtop the dam by 4.9 feet. The spillway is adequate to pass 15 percent of the test flood.

Within one year of receipt of the Phase I Inspection Report, the owner should retain a qualified registered engineer to accomplish the following: 1) Conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity. 2) Investigate the subsidence of the concrete pavement adjacent to the upstream face of the dam and design remedial measures as needed. 3) Investigate the structural condition of the right stone masonry spillway training wall and design remedial measures as needed. The owner should carry out the recommendations made by the engineer.

The owner should also carry out the following operational and maintenance procedures: 1) Engage a qualified registered engineer to make a comprehensive technical inspection once every year and 2) Establish a surveillance program for use during and immediately after heavy rainfall, and also a warning program to follow in case of emergency conditions.

S. Giavara, P.E.
President

Registered CT. 7634

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

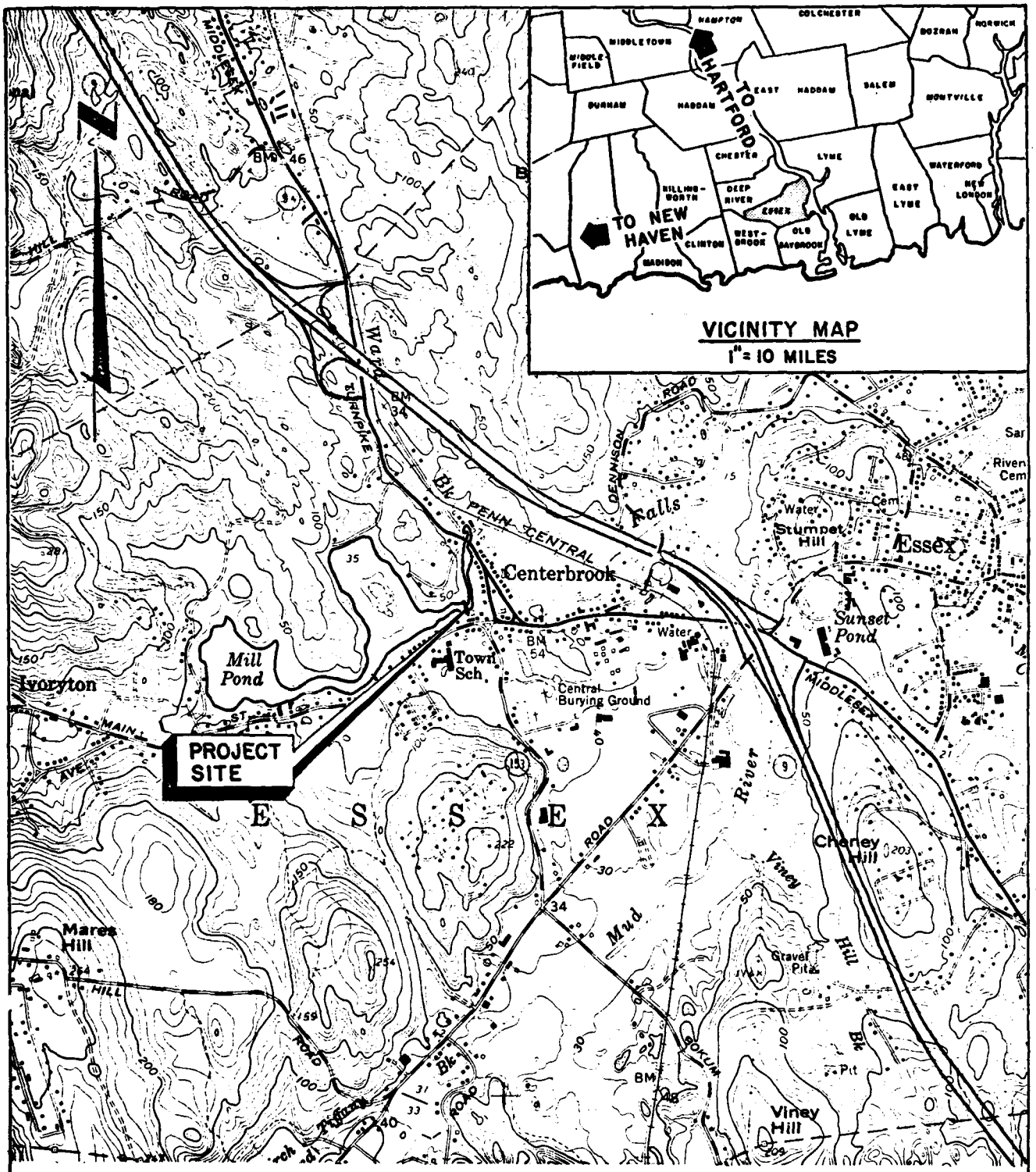
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

APPENDIXES

OVERVIEW PHOTO
Mill Pond Dam



SCALE IN FEET

2000 1000 0 2000

MILL POND DAM

LOCATION MAP

ESSEX, CONNECTICUT

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
MILL POND DAM - CT 00423

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection through the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Flaherty Giavara Associates, P.C. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of 19 October 1979 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0001 has been assigned by the Corps of Engineers for this work.

b. Purpose.

1) Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2) Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF THE PROJECT:

a. Location. Mill Pond Dam is located on Main Street in the village of Centerbrook, which is part of the Town of Essex, Connecticut. Access to the dam is from Main Street to the rear of Moore Grover Harper, P.C. offices. The reservoir is shown on the U.S.G.S. Topographic Map "Essex, Connecticut" at a latitude of 41°21'07" and a longitude of 72°25'07". The Location Map on page vi shows the location of the dam.

b. Description of Dam and Appurtenances. Mill Pond Dam is 200 feet in length including the spillway section and has a maximum height of 18 feet. The dam consists of an embankment material of unknown composition. The upstream face of the dam is a vertical mortared stone masonry wall partially replaced in areas with concrete. At the downstream face of the dam is a

concrete wall approximately 12 feet in height and 4 feet in width at the top. This wall is not original to the dam. The face of the wall is battered at 1 horizontal to 12 vertical. The crest of the dam contains areas of a concrete slab and evidence of an old foundation. The crest width of the dam varies as shown on the sketch plan of the dam (Appendix B).

The spillway is 68 feet in length extending from the left abutment. The original construction of the spillway was stone masonry. A concrete surface has been added to the spillway, forming a curvilinear downstream face. The old stone masonry portion of the spillway is visible on the downstream face at the angle point in the spillway. Along the right side of the spillway is a concrete training wall.

The outlet works consist of an intake structure, penstock, a turbine chamber, and a tailrace. The intake to the penstock tunnel is located at the upstream face of the dam near the right abutment. The structure consists of a concrete wall with manually operated wood sluicegates. The two sluicegates are 2' wide by 4' deep. The penstock which transmits water to the turbine chamber is a stone masonry tunnel (8 feet x 8 feet). The turbine chamber is located in the old factory which presently houses the office of the owner. The turbine is presently undergoing restoration and is expected to become operational in the near future. The tailrace returns the water to the river below the dam and consists of a stone masonry channel. The outlet works are presently operational and provide the dam with a low level drawdown capability.

c. Size Classification. Mill Pond Dam has a storage volume of 464 acre-feet and a dam height of 18 feet. A storage volume of greater than 50 acre-feet but less than 1000 acre-feet classifies this structure in the "small" category according to guidelines established by the Corps of Engineers.

d. Hazard Classification. The dam is classified as having a "high" hazard potential. The areas of probable impact include several residential homes along Middlesex Turnpike (Route 9A) and two commercial establishments adjacent to the river below this roadway. The dam failure analysis indicates that approximately three (3) habitable structures would be flooded with water to a depth of greater than two (2) feet. In addition, economic loss may be extensive to the Middlesex Turnpike located 1000 feet downstream of the dam.

e. Ownership. The dam is owned by the Main Street Partnership c/o Harper Grover Moore, P.C., Main Street, Centerbrook, Connecticut 06409, Phone: 203-767-0101.

f. Operator. The operator of the dam is Mr. William Grover, c/o Harper Grover Moore, P.C., Main Street, Centerbrook, Connecticut 06409, Phone: 203-767-0101.

g. Purpose of Dam. The dam was originally constructed to supply water power for a saw and grist mill. It was used for water power until the 1950's. The turbine is presently being restored to supply power for Harper Grover Moore, P.C. and other occupants of the building.

h. Design and Construction History. The history of this structure is found in the book The History of Middlesex County. The dam was authorized for construction in 1714 by the King of England. In 1721 construction of the dam was completed. The present turbine was installed in 1913. The date of construction of the concrete wall and concrete spillway facing are unknown. The present owners undertake routine maintenance including recent concrete repairs.

i. Normal Operation Procedures. Because the dam is not currently used for water power, water is discharged over the spillway. It is the operational procedure of the owners to activate the outlet works in anticipation of a serious storm threat.

1.3 PERTINENT DATA:

a. Drainage Area. Mill Pond has a drainage area of 11.3 square miles, consisting of wooded hilly upland terrain. The watershed area is sparsely developed with the exception of the moderately developed Ivoryton area. Upstream impoundments include Messerschmidt Pond, Wright's Pond, Bushy Hill Pond, and Comstock Pond.

b. Discharge at Dam Site.

1) The outlet works consist of a concrete intake structure at the upstream face of the dam. Water is transmitted through the structure by two manually operated wooden sluicegates (2 feet wide x 4 feet deep). The invert elevation of the sluicegates are unknown, therefore the discharge capacity cannot be computed.

2) The owner reports that approximately two (2) times in the last ten years the flood stage was even with the top of the dam.

3) The ungated spillway capacity at the top of dam - 1220 cfs @ El. 38.3.

4) The ungated spillway capacity at the test flood elevation - 4790 cfs @ El. 43.2.

5) The gated spillway capacity at normal pool elevation is not applicable at this dam.

6) The gated spillway capacity at test flood elevation is not applicable at this dam.

7) The total spillway capacity at test flood elevation - 4790 @ El. 43.2.

8) The total project discharge at the top of dam - 1220 cfs @ El. 38.3.

9) The total project discharge at test flood elevation - 8070 cfs @ El. 43.2.

c. Elevation. (NGVD)

1) Streambed at toe of dam.....20±

2) Bottom of cut-off.....Unknown

3) Maximum tailwater.....N/A

4) Recreation pool.....N/A

5) Full flood control pool.....N/A

6) Spillway crest.....35±

7) Design surcharge.....Unknown

8) Top of dam.....38.3

9) Test flood surcharge.....43.2

d. Reservoir. (Length in Feet)

1) Normal pool.....4,000±

2) Flood control pool.....N/A

3) Spillway crest pool.....4,000±

4) Top of dam.....4,200±

5) Test flood pool.....5,000±

e. Storage. (acre-feet)

1) Normal pool.....240

2) Flood control pool.....N/A

3) Spillway crest pool.....240

4) Top of dam.....464

5) Test flood pool.....800

f. Reservoir Surface. (acres)

1) Normal pool.....59

2) Flood control pool.....N/A

3) Spillway crest.....59

4) Test flood pool.....78

5) Top of dam.....100

g. Dam.

1)	Type:	Embankment (unknown composition), masonry U/S face, concrete D/S face, spillway - masonry faced with concrete
2)	Length:	200 feet
3)	Height:	18 feet
4)	Top Width:	30 to 60 feet
5)	Side Slopes:	U/S vertical D/S 1 horizontal to 12 vertical
6)	Zoning:	Unknown
7)	Impervious Core:	Unknown
8)	Cut-off:	Unknown
9)	Grout Curtain:	Unknown

h. Diversion and Regulating Tunnel.

1)	Type:	N/A
2)	Length:	N/A
3)	Closure:	N/A
4)	Access:	N/A
5)	Regulating Facilities:	N/A

i. Spillway.

1) Type:	Broad crested stone masonry with concrete face - curvilinear D/S face
2) Length of Weir:	68 feet
3) Crest Elevation:	35.0 feet
4) Gates:	None
5) U/S Channel:	Reservoir
6) D/S Channel:	Natural stream - sand, gravel & silt bottom

j. Regulating Outlets.

1) Invert:	Unknown
2) Size:	2 @ 2' x 4'
3) Description:	Wood sluicegates
4) Control Mechanism:	Manual gear operation

SECTION 2 - ENGINEERING DATA

2.1 DESIGN:

No engineering data has been found to provide any information about the design of Mill Pond Dam.

2.2 CONSTRUCTION:

No information relative to the construction of the dam is available. Information presented in this report was primarily obtained by interviews and direct field measurements of the existing dam.

2.3 OPERATION:

Formal operation records are not available for this dam.

2.4 EVALUATION:

a. Availability. There are no plans, specifications or computations available from the owner or State regarding the design, construction or subsequent repairs and modifications to this dam.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of the dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgement.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS:

a. General. Based on the visual inspection, the Mill Pond Dam appears to be in fair condition. The right side of the dam consists of an upstream face of mortared stone masonry, unknown fill material and a downstream concrete wall. The upstream face is a nearly vertical, mortared stone masonry wall. A portion of the masonry wall has apparently been replaced by poured concrete gravity type wall. Evidence of the remains of mill buildings were noted at the top of the dam. Some settlement and cracking of the concrete floor slab has occurred at several locations. The most pronounced settlement appears to have occurred near the upstream face on the right side of the dam. At this location the largest depression is approximately 5 ft. in diameter and 8-in.-deep. Nothing is known about the conditions below the concrete slab. A small portion of the upstream surface is grass covered and contains several trees.

The downstream face of the dam appears to be in good condition. (Nothing is known about the cross-section of this wall or the extent to which the wall extends below the downstream toe.)

Downstream from the concrete portion of the dam a nearly level grassed area was observed. The grassed area indicated no visible seepage and was in generally good condition.

A portion of the right spillway training wall had collapsed for a distance of approximately 18 ft. as noted in Photo No. 11. Most of the stone masonry blocks have been removed in this section and the embankment has been eroded back for a distance of approximately 8 ft. A cast iron drainage pipe is located adjacent to the end of the concrete training wall in this collapsed section. It is not known where the pipe originates. Other portions of the existing wall have been undermined causing masonry blocks to be removed.

b. Dam.

1) Upstream Face - The upstream face of the dam is comprised of mortared stone masonry (see Photo No. 13). The stone pointing is in fair condition. Several voids in the upstream face indicate that material has been lost by erosion.

2) Crest - The crest of the dam is used for storage. The surface of the crest is a concrete slab pavement that has settled and cracked as indicated in Photo No. 9. (The largest depression is approximately 5 ft. in diameter and 8-in-deep.)

3) Downstream Face - The concrete facing on the downstream face is in good condition. No efflorescence, spalling or cracking was noted (see Photos No. 1, No. 2 and No. 3). The

downstream grassed area was generally in good condition. No seepage or boils were noted in the grassed area (Photos No. 1, No. 2 and No. 8).

4) Spillway - The visible face of the spillway consists of concrete in fair condition (Photos No. 4, No. 5 and No. 7). The owner reported that the existing concrete covers an old stone masonry spillway structure. Near the left abutment the concrete spillway connects to ledge rock as shown in Photo No. 6. The spillway discharge channel has an area of erosion 18 feet in length and 8 feet wide along the south bank of the channel at the base of the spillway (Photos No. 11 and No. 12).

c. Appurtenant Structures. The outlet works consists of a stone masonry penstock tunnel, an inoperable turbine chamber, and a stone masonry tailrace channel. The turbine is presently being repaired and is anticipated to become operational in the near future. The tailrace channel is eroded at the base of the side walls near its outlet to the main river channel.

The inlet to the outlet works (Photo No. 10) is manually operated and the visible portion appears in good condition. New wooden sluicegates were recently installed.

d. Reservoir Area. The perimeter of the reservoir varies from flat and landscaped to moderate and wooded. There is no evidence of slides or slope failures. No sediment deposits were observed above the water level of the reservoir (see Photo No. 15).

e. Downstream Channel. The channel consists of the Falls River which is approximately 70 feet in width with a bed of silt, sand, and gravel. The bank of the river is vegetated and stable (Photo No. 14).

3.2 EVALUATION:

Based on the results of the visual inspection, the dam is judged to be in fair condition. The following conditions could affect the long-term performance of the dam:

a. Continued settlement of the concrete pavement upstream of the concrete wall suggests material is being removed from below the slab probably from wave action.

b. Continued erosion and collapse of the right spillway training wall could lead to continued deterioration of these structures and eventually collapse. A collapse could affect the long-term performance of the dam.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES:

a. General. The dam is equipped with a method of lowering the water level by opening gates which transmit water through the turbine chamber and thence to a tailrace. In operation the pond level can be lowered about 1 foot per day (owner estimate). The gates are operable and were opened slightly during the inspection.

b. Description of any Warning System in Effect. There is no warning system of any kind in effect at the dam.

4.2 MAINTENANCE PROCEDURES:

a. General. Maintenance of the dam appears to be generally lacking.

b. Operating Facilities. The operating facilities are being restored and will be utilized to provide water power. The sluice-gates are of recent construction and well-maintained.

4.3 EVALUATION:

Regular operational maintenance for this dam and its appurtenances has not been developed or implemented.

An emergency action plan should be prepared to prevent or minimize the impact of failure. This plan should list the expedient action to be taken and authorities to be contacted.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL DATA:

Mill Pond Dam is an earth embankment/stone masonry structure witha concrete wall along its downstream face. The length of the dam is 200 feet with a dam height of 18 feet. The spillway is 68 feet in length and is located at the left abutment of the dam. It consists of stone masonry with concrete facing. The spillway acts as a broad crested weir with a sloping downstream face. At a stage of 3.3 feet above the spillway, the dam would be overtopped. The outlet works consists of a stone masonry penstock tunnel (8 feet x 8 feet), a turbine chamber, and a stone masonry tailrace channel (4-7 feet high x 10 feet wide). The intake to the penstock tunnel is located at the upstream face of the dam near the right abutment. The intake is through two manually operated wooden sluicegates (2 feet wide x 4 feet high).

Mill Pond, located on Falls River, has a watershed area of 11.3 square miles, consisting of wooded hilly upland terrain. The watershed area is sparsely developed with the exception of the moderately developed Ivoryton area. Future land development within the watershed is anticipated to take place at a slow pace due to its rural nature and topographic limitations. Upstream impoundments include Messerschmidt Pond, Wright's Pond, Bushy Hill Pond, and Comstock Pond, all of which act to attenuate peak flows.

5.2 DESIGN DATA:

No specific data is available for this watershed or the structures at Old Mill Pond Dam. In lieu of existing design information, U.S.G.S. Topographic Maps (scale 1" to 2000') were utilized to develop hydrologic parameters. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual field inspection.

5.3 EXPERIENCE DATA:

The owner of the dam reported that two times in the last ten years the flood stage was even with the top of the dam.

5.4 TEST FLOOD ANALYSIS:

The Test Flood for determining the spillway adequacy is based on Corps of Engineers guildeines. The size of the dam is small based on a storage volume of 464 acre-feet and a height of 18 feet. The hazard classification is "high" because more than a

few inhabitable structures downstream would have a water surface level two feet greater than the first floor elevation due to the flood wave and there is a potential for loss of life. Corps of Engineers guildelines for a "small" dam with "high" hazard gives a range for the selection of the Test Flood from ½ PMF to PMF.

The Test Flood selected for this project is the ½ PMF. This test flood was selected due to the dam's height (18 feet) and the relatively small number of inhabitable structures adversely impacted by the flood wave.

The magnitude of the Test Flood (½ PMF) was based on "Preliminary Guidance for Estimating PMF Discharges by the New England Division, Corps of Engineers," dated December 1977. The flood magnitude was based on the "rolling" watershed curve. The ½ PMF (Spillway Test Flood inflow) is 9040 CFS.

The Test Flood inflow was formed into a triangular hydrograph with a peak flow of 9040 CFS and a duration of 13.5 hours. The time to peak was set at one-third the total duration or 4.5 hours. The duration was selected so that the triangular hydrograph contains the same volume of water as the estimated storm runoff.

The developed hydrograph was routed through the reservoir using a computer program based on stage-storage and stage-discharge data. The reservoir was assumed to be full and level with the spillway prior to the storm event. The outlet works were assumed to be closed. An effective crest length of 101 feet was used due to a structure at the dam which would obstruct overtopping flow. The results of the flood routing indicate that the spillway test flood outflow would be 8070 CFS at a maximum reservoir stage of 43.2 feet. The reduction of the Test Flood inflow of 9040 CFS to an outflow of 8070 CFS represents a reservoir attenuation of 11 percent. This analysis indicates that the dam would be overtopped by a maximum depth of 4.9 feet. The total duration of overtopping would be 12 hours for this 13.5 hour period. The maximum spillway capacity without dam overtopping is 1223 CFS. The spillway can pass 15 percent of the spillway test flood outflow.

5.5 DAM FAILURE ANALYSIS:

The downstream impact of a dam failure was analyzed using the COE "Rule of Thumb Guidance for Estimating Downstream Failure Hydrographs" dated April 1979.

Based on an assumed breach width equal to 40 percent of the dam's width at med-height, the total peak outflow due to a flood wave from the dam would be 11,488 CFS. This includes an initial base flow of 1223 CFS which is the spillway outflow with the water surface at the top of the dam.

The areas of probable impact include several residential homes along Middlesex Turnpike (Route 9A) between 500-1,000 feet downstream of the dam. In addition, two small commercial establishments are located adjacent to Falls River approximately 1,200 feet downstream of the dam. A carpenter shop immediately downstream would be in the dam failure impact area and subjected to 3 feet of flooding above the first floor elevation. The flood wave analysis indicates that approximately four inhabitable structures (three commercial establishments and one residence) would be inundated with flood wave waters to a depth of 2 to 4 feet above first floor elevation. The analysis also indicates that none of the identified structures in the dam failure impact area would be flooded as a result of the flow of the test flood discharge. The height of water in the downstream impact area prior to and just after assumed dam failure is four to nine feet respectively. For streambed and building elevations see Appendix "D".

Economic loss may be extensive to the Middlesex Turnpike (Route 9A) located 1,000 feet downstream of the dam. With the possibility of the loss of more than a few lives and probability of excessive economic losses the dam has been classified as having a high hazard potential.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS:

The visual inspection did not disclose any evidence of present structural instability. Continued erosion and collapse of the right spillway training wall could affect the long-term performance of the dam.

6.2 DESIGN AND CONSTRUCTION DATA:

No design and construction data are available for the dam. Thus, the assessment of stability is based only on the visual inspection.

6.3 POST-CONSTRUCTION CHANGES:

No post-construction information is available for the dam. It is apparent, however, that the dam structure has been modified since its original construction (i.e., new gates, spillway repair, concrete facing, etc.).

6.4 SEISMIC STABILITY:

The dam is located in Seismic Zone 1 and, in accordance with the recommended Phase I inspection guideline, does not warrant seismic stability analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 ASSESSMENT:

a. Condition. The visual examination indicates that the Mill Pond Dam is in fair condition. The major concerns with respect to the long-term performance of the dam are:

1) Subsidence of the concrete pavement adjacent to the upstream face of the dam.

2) Erosion and collapse of portions of the right spillway training wall.

b. Adequacy. The engineering information available was very limited and thus assessment of the condition of the dam was based primarily on the results of the visual inspection, past operational performance of the structure and sound engineering judgement.

c. Urgency. The recommendations and remedial measures presented in Sections 7.2 and 7.3 should be implemented by the owner within one year of receipt of this Phase I inspection report.

7.2 RECOMMENDATIONS:

The owner should retain a qualified registered engineer to accomplish the following:

a. Conduct more refined hydrologic and hydraulic analysis to determine the need for and methods of increasing the project discharge capacity.

b. Investigate the subsidence of the concrete pavement adjacent to the upstream face of the dam and design remedial measures as needed.

c. Investigate the structural condition of the right stone masonry spillway training wall and design remedial measures as needed.

The owner should carry out the recommendations made by the engineer.

7.3 REMEDIAL MEASURES:

a. Operating and Maintenance Procedures. The owner should:

1) Engage a qualified registered engineer to make a comprehensive technical inspection once every year.

2) Establish a surveillance program for use during and immediately after heavy rainfall, and also a warning program to follow in case of emergency conditions.

7.4 ALTERNATIVES:

There are no practical alternatives to the recommendations contained in Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Mill Pond Dam

DATE November 1, 1979

TIME 0830

WEATHER Sunny - 55°F

W.S. ELEV.____ U.S.____ DN.S.

PARTY:

1. R. Smith, FGA, Project Manager
2. P. Burgess, FGA, Hydraulics/Hydrology
3. R. Murdock, GEI, Geotechnical
4.
5.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	Settlement of concrete pavement near the upstream face of dam
Movement or Settlement of Crest	
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	None
Unusual Movement or Cracking at or near Toes	Not applicable
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	Unknown
Toe Drains	None
Instrumentation System	None
Vegetation	None

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
DIKE EMBANKMENT	Not applicable
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	None - Reservoir
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	Generally good condition.
Stop Logs and Slots	New sluicegate.

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	Not applicable
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	Penstock, not visible for inspection.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Tailrace in generally fair condition. Mortared stone walls show evidence of localized failure.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Underwater
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Generally fair condition, some deterioration of concrete noted
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	No
Any Seepage or Efflorescence	None
Drain Holes	Two 6" diameter drain holes
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None, part of wall collapsed along right bank
Trees Overhanging Channel	A few small trees
Floor of Channel	Natural sand and gravel bottom
Other Obstructions	None

PERIODIC INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Mill Pond Dam DATE: Nov. 1, 1979

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	Not applicable
a. Superstructure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat and Backwall	

APPENDIX B

ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Pond Dam

I.D. NO. CT 00423

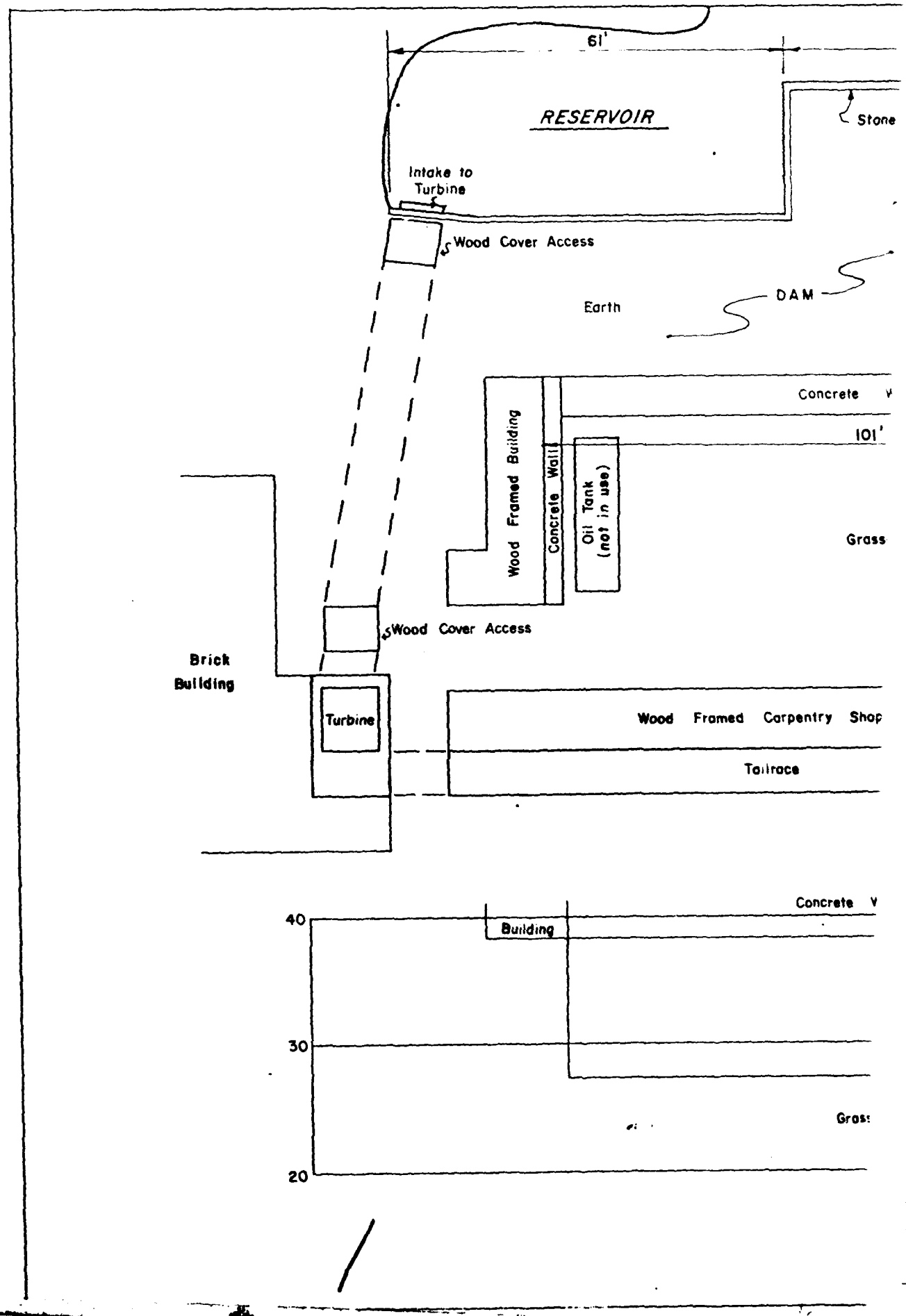
ITEM	REMARKS
AS-BUILT DRAWINGS	None available
REGIONAL VICINITY MAP	Available from U.S.G.S.
CONSTRUCTION HISTORY	
TYPICAL SECTIONS OF DAM	None
OUTLETS - Plan	Field Measurements
- Details	Field Measurements
- Constraints	Turbine
- Discharge Ratings	None Available
RAINFALL/RESERVOIR RECORDS	Unavailable
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	None
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	None
BORINGS RECORDS	None
LABORATORY	None
FIELD	None

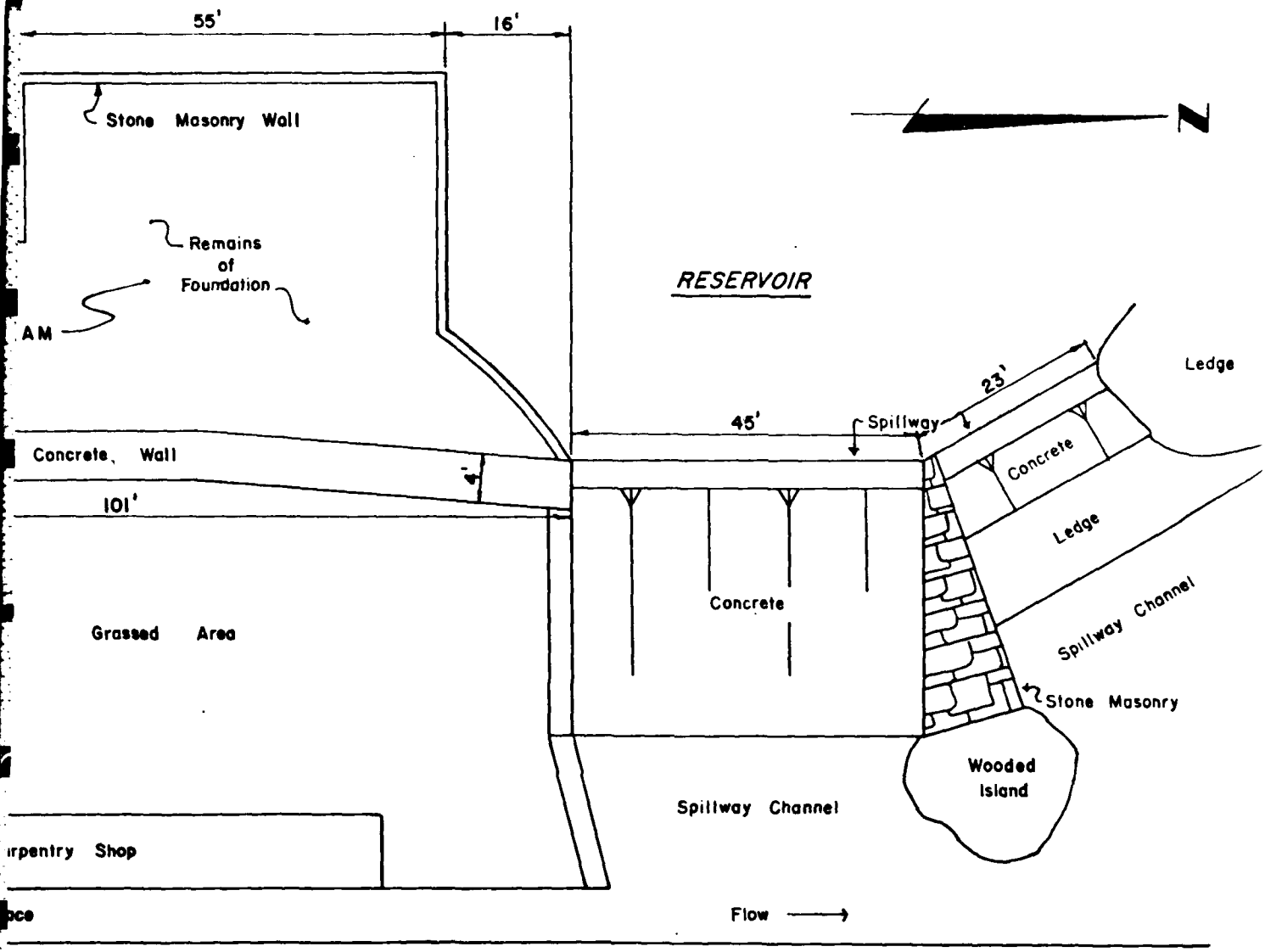
CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Pond Dam

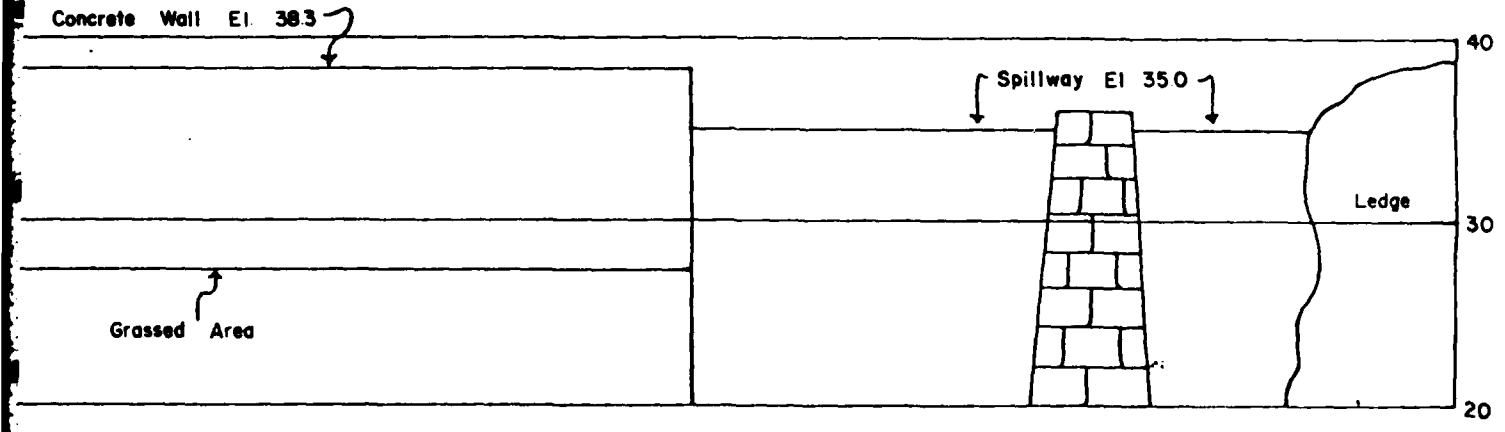
I.D. NO. CT 00303

ITEM	REMARKS
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Unknown
MONITORING SYSTEMS	Unknown
MODIFICATIONS	Modifications made to spillway, downstream face, outlet structures, - plans not available
HIGH POOL RECORDS	None
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown
MAINTENANCE OPERATION RECORDS	Unavailable
SPILLWAY PLAN	
SECTIONS	Field Measurements
DETAILS	Field Measurements
OPERATING EQUIPMENT PLANS & DETAILS	Not available


61'
RESERVOIR
Stone
Intake to Turbine
Wood Cover Access
Earth
DAM
Concrete
101'
Wood Framed Building
Concrete Wall
Oil Tank (not in use)
Grass
Wood Cover Access
Brick Building
Turbine
Wood Framed Carpentry Shop
Tailrace
Concrete
40
Building
30
Grass
20



PLAN
NTS

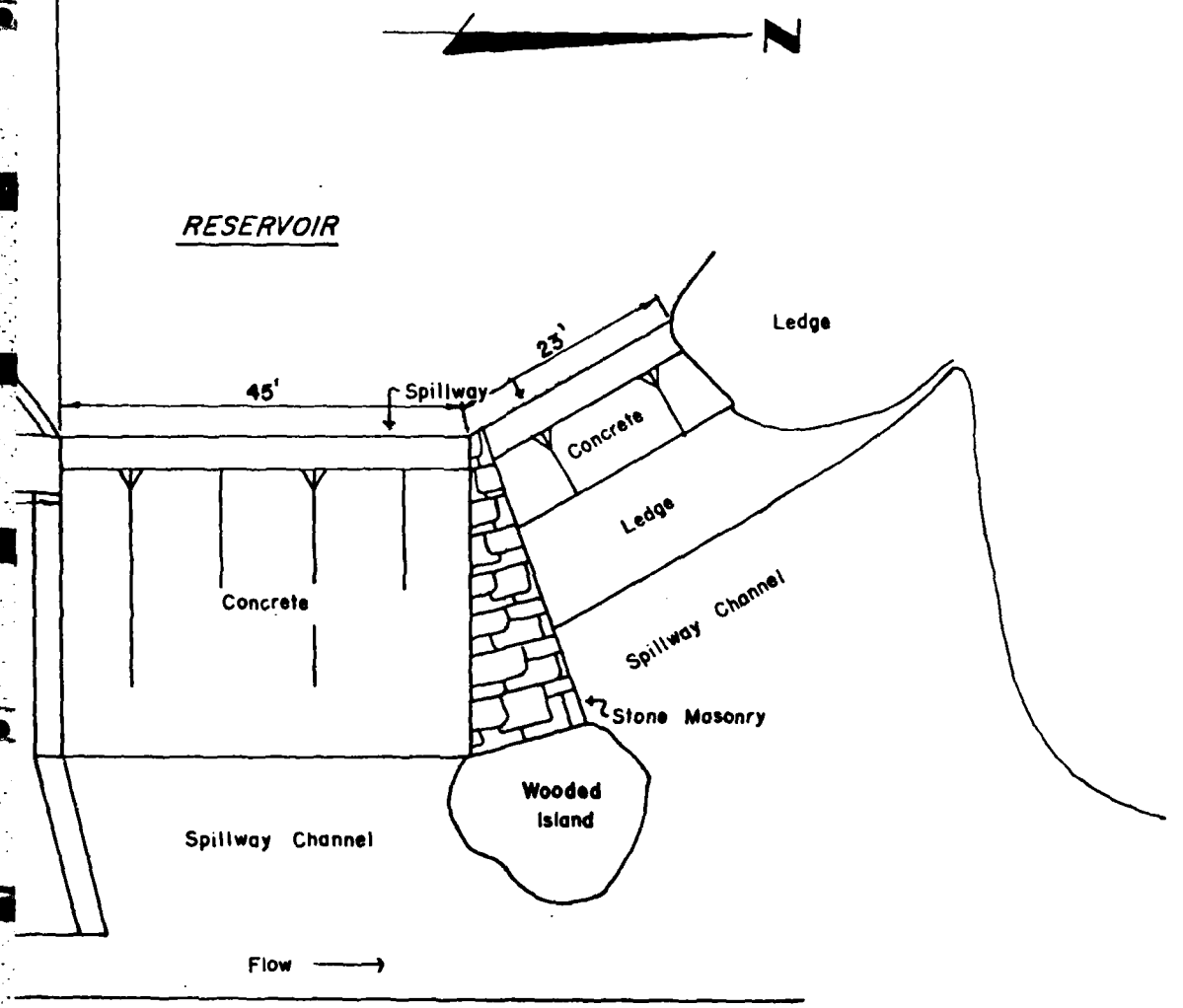


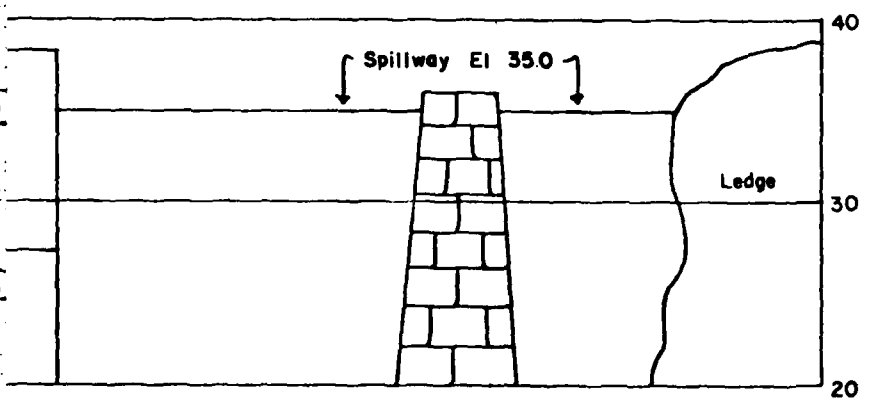
PROFILE
NTS

2

MILL P(

3





MILL POND DAM

B-3

3

APPENDIX C

PHOTOGRAPHS

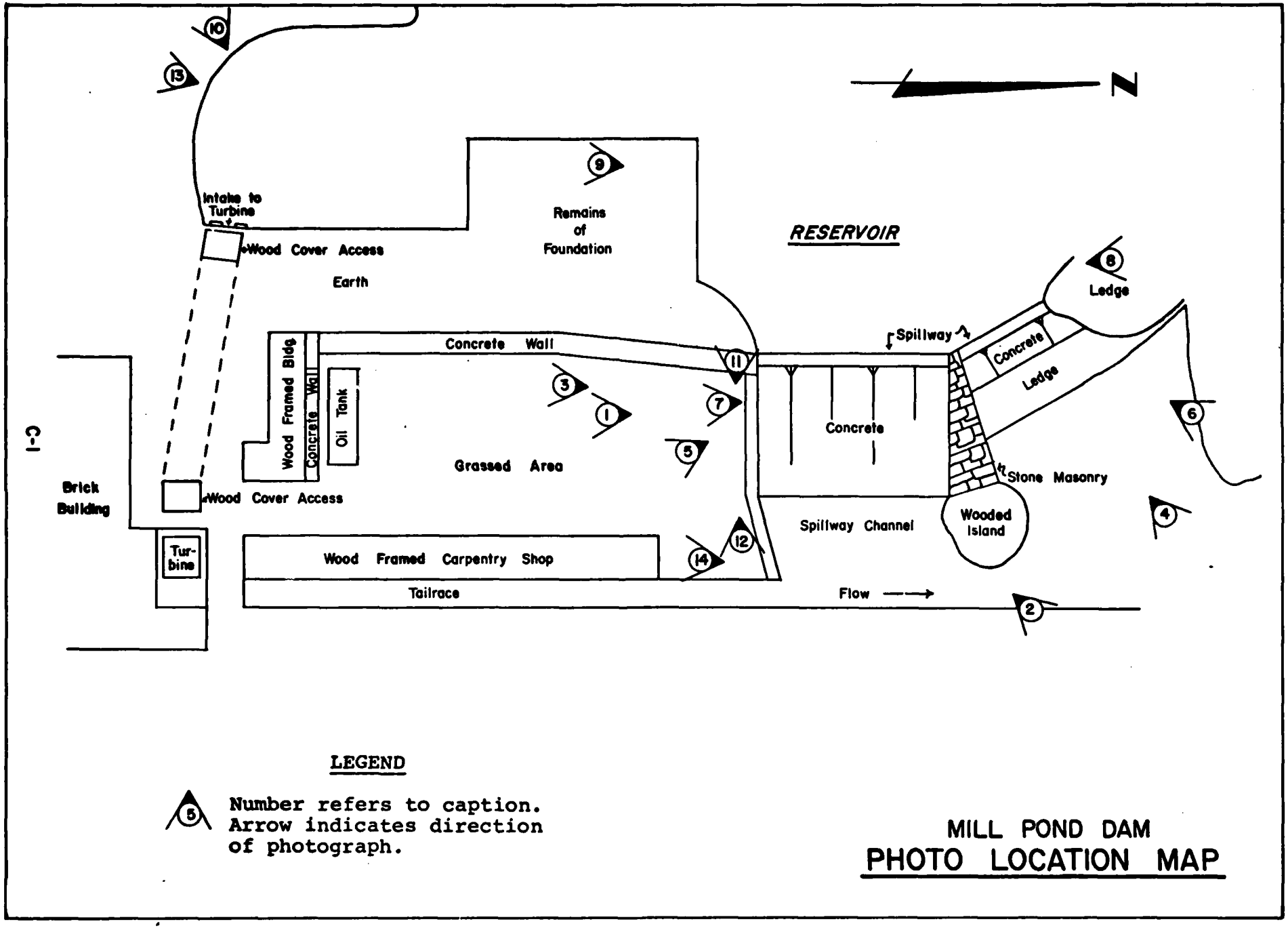

N
RESERVOIR
Intake to Turbine
Wood Cover Access
Earth
Remains of Foundation
Concrete Wall
Wood Framed Bldg.
Concrete Wall
Oil Tank
Grassed Area
Brick Building
Wood Cover Access
Tur-bine
Wood Framed Carpentry Shop
Tailrace
Flow
Spillway
Concrete
Ledge
Concrete
Ledge
Stone Masonry
Wooded Island
Spillway Channel
C-1
LEGEND
Number refers to caption.
Arrow indicates direction of photograph.
MILL POND DAM
PHOTO LOCATION MAP

PHOTO #1: Downstream face of dam, from right side.

PHOTO #2: Downstream face of dam, looking upstream.

PHOTO #3: Crest of dam, from right abutment.

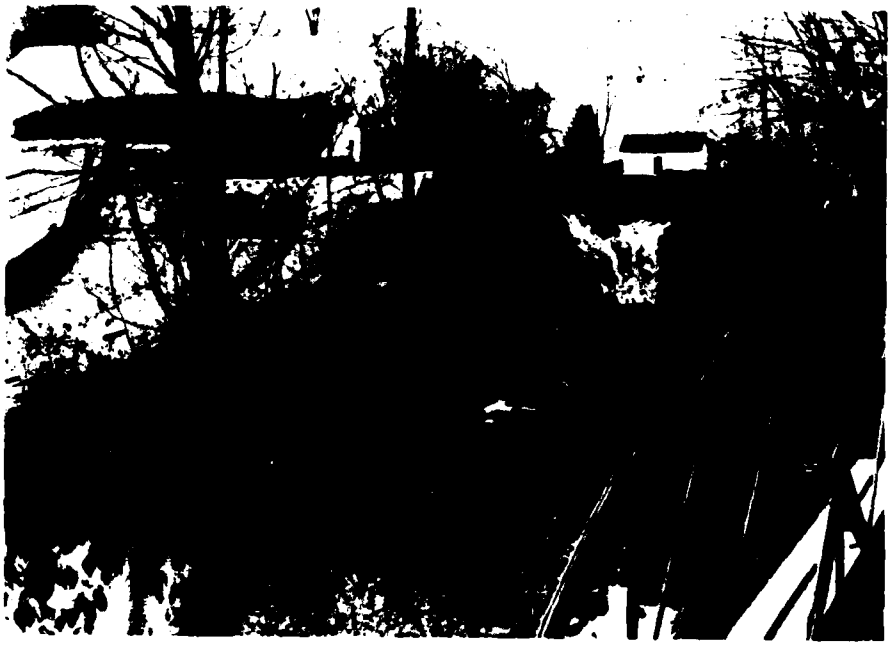


PHOTO #4: Spillway looking upstream.

PHOTO #5: Spillway (right).

PHOTO #6: Spillway (left).

PHOTO #7: Right spillway (detail), looking toward left abutment.

PHOTO #8: Top of spillway, from left abutment, looking downstream.

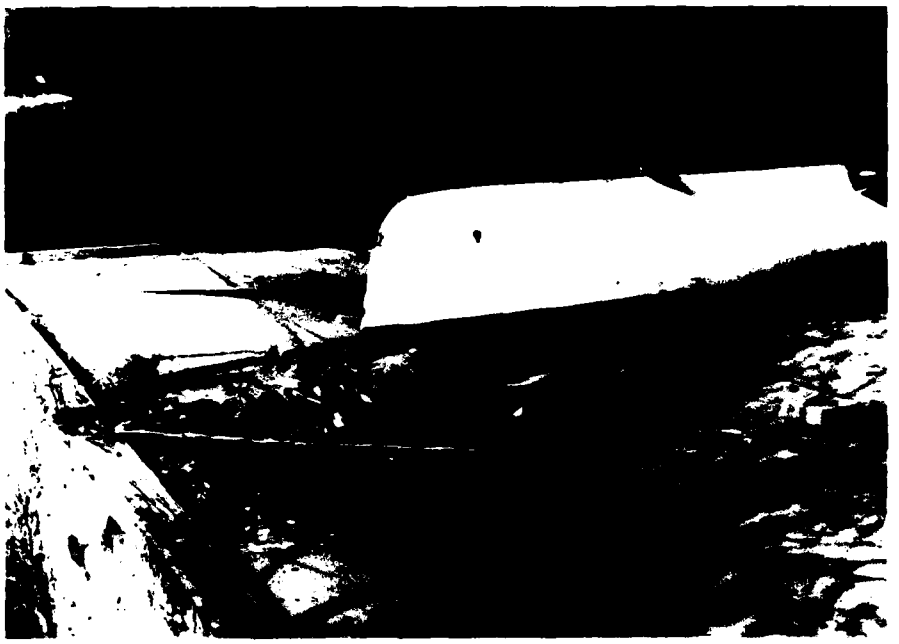


PHOTO #9: Crest of dam, note settlement and cracking.

PHOTO #10: Intake structure, from upstream.

PHOTO #11: Eroded area, right spillway training wall.

PHOTO #12: Detail, erosion at end of right spillway training wall.

PHOTO #13: Upstream face and crest of dam, from left side.

PHOTO #14: Downstream channel.

PHOTO #15: Reservoir area.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

PROJECT 799010
MILL POND DAM
ESSEX CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA NEW HAVEN, CONN 06510/203/789-1260

SHEET NO. _____ OF _____
BY RAC DATE 2-29-80
CHK'D. BY PB DATE 3-18-80

DETERMINATION OF SPILLWAY TEST FLOOD*

A. SIZE CLASSIFICATION

Storage Volume (Ac.-Ft.) 464

Height of Dam (Ft.) 18

Size Classification SMALL

B. HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life	Economic Loss
Low	None expected	Minimal
Significant	Few	Appreciable
High	More than few	Excessive

Hazard Classification HIGH

C. HYDROLOGIC EVALUATION GUIDELINES

Hazard	Size	Spillway Test Flood
Low	Small	50 to 100-Year Frequency
	Intermediate	100-Year Frequency to 1/2 PMF
	Large	1/2 PMF to PMF
Significant	Small	100-Year Frequency to 1/2 PMF
	Intermediate	1/2 PMF to PMF
	Large	PMF
High	Small	1/2 PMF to PMF
	Intermediate	PMF
	Large	PMF

Spillway Test Flood 1/2 PMF

*Based upon "Recommended Guidelines for Safety Inspection of Dams" Department of the Army, Office of the Chief of Engineers, November 1976.

T 79010
L POND DAM
STK CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 2 OF
BY LLC DATE 2-19-80
CHK'D. BY PB DATE 3-18-80

DETERMINATION OF THE

MAXIMUM PROBABLE FLOOD (MPF)

A. Drainage Area in Square Miles 11.3

B. Watershed Characteristic: Flat & Coastal

(Rolling)

Moutainous

C. M.P.F. in CFS/Square Mile,* 1600

M.P.F. = (CFS/Square Mile) x (Area in Square Miles)

11.3 x 1600 = 18,080

1/2 PMF = 9040 CFS

*Based upon the figure "Maximum Probable Flood Peak Flow Rates"
U.S. Army Corps of Engineers, December 1977.

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

THE PMP RAINFALL IS 24.2 INCHES FOR A 6 HOUR DURATION STORM. USING A 20% FACTOR FOR IMPERFECT FIT, THE EFFECTIVE RAINFALL IS 19.4 INCHES (SEE FIG 15, DESIGN OF SMALL DAMS)

VOLUME OF RUNOFF

BASED ON AN ASSUMED CN VALUE OF 80 (FOR GLACIAL TILL SOILS), RUNOFF FOR THE PMP IS 16.7 INCHES (FIG A-4, DESIGN OF SMALL DAMS).

SPILLWAY TEST FLOOD RUNOFF = 1/2 PMF

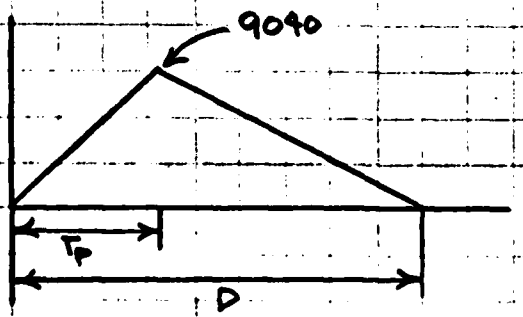
$$(\tfrac{1}{2})(16.7) = 8.35''$$

VOLUME =

$$\left(\frac{8.35''}{12''/FT}\right)\left(11.3\ MI^2\right)\left(\frac{640\ AC}{MI^2}\right) = 5032\ AC\text{-}FT$$

TEST FLOOD HYDROGRAPH

A TRIANGULAR HYDROGRAPH IS TO BE USED FOR THE ROUTING OF THE TEST FLOOD THROUGH THE RESERVOIR, PEAK FLOW EQUALS 9040 CFS, SET DURATION OF RUNOFF SO AS TO CONTAIN VOLUME OF RUNOFF, AND RECEEDING LIMB EQUALS TWICE THE RISING LIMB.



FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

HYDROGRAPH $VOL = \frac{1}{2} Q_p D$

$5032 = \frac{1}{2} Q_p D$

$5032 = \frac{1}{2}(9040) D$

$$D = \frac{(5032 \text{ AC-FT})(43560 \text{ } F^3/\text{AC-FT})}{(.5)(9040 \text{ CFS})(60 \text{ S/M})(60 \text{ M/HR})} = 13.47 \text{ HRS}$$ SAY 13.5 HRS

$D = 13.5$ $T_p = 4.5$

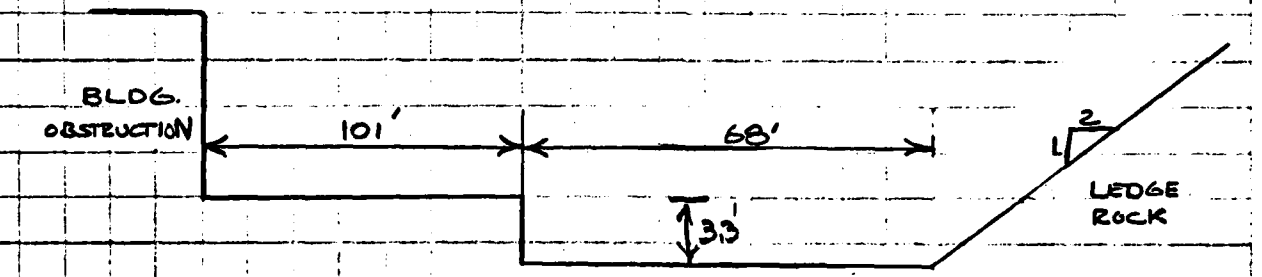
HYDROGRAPH FORMATION

$Q_p = 9040$ CFS $D = 13.5$ HRS $T_p = 4.5$ HRS

TIME (HRS)	INFLOW (CFS)
0	0
1	2009
2	4018
3	6027
4	8036
4.5	9040
5	8538
6	7534
7	6529
8	5525
9	4520
10	3516
11	2511
12	1507
13	502
13.5	0

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SPILLWAY N.T.S

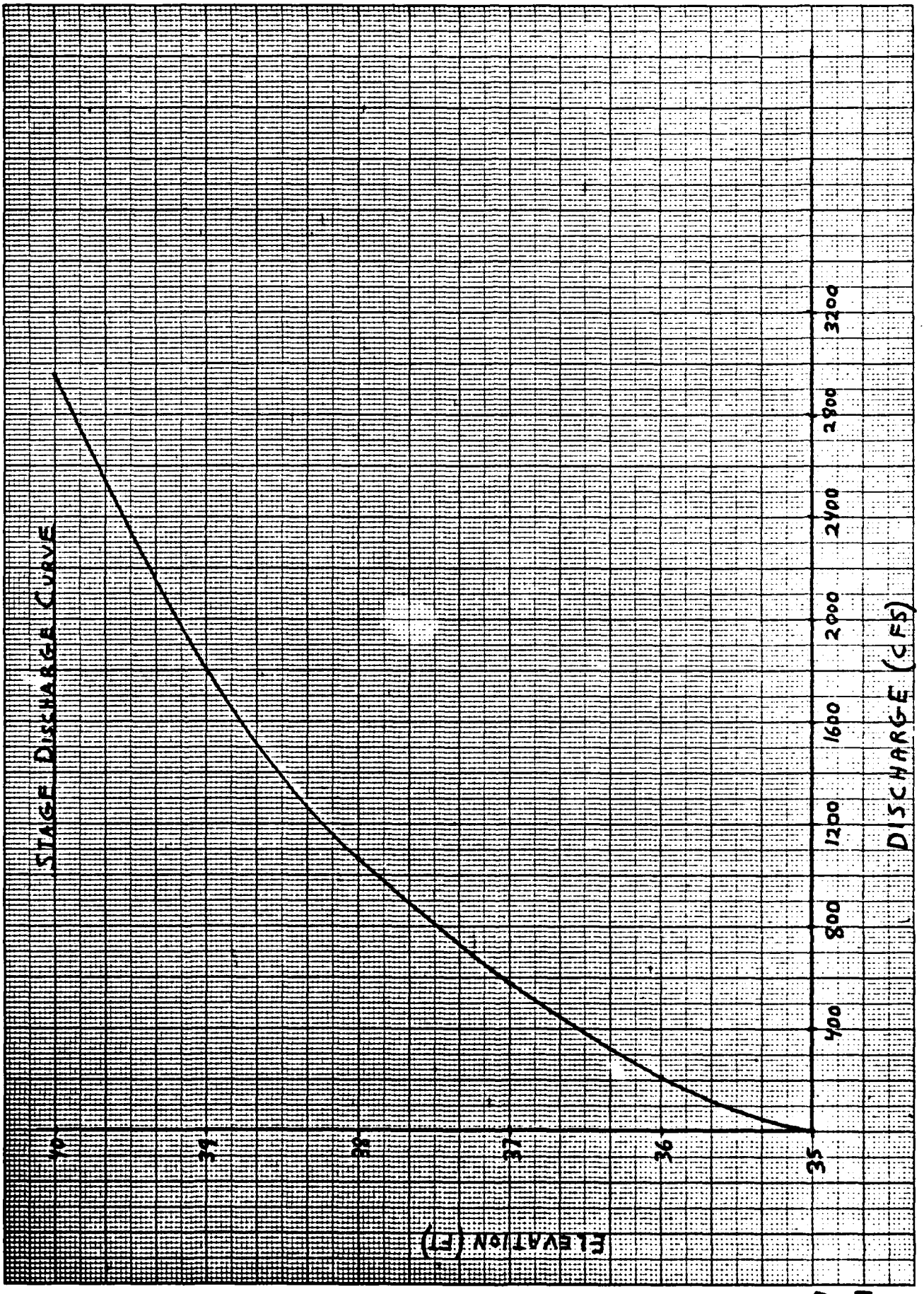


SEGMENT	ITEM	"C"	LENGTH	ELEV
1	BROADCREST CONC. GRAVITY DAM	3.0	101'	38.3
2	SPILLWAY CONC. FACE	3.0	68'	35.0 USGS

I.E. = 35.0
I.V. = 0.0
E = 35.0 A = 58.8 Ac
E = 40.0 A = 87.2 Ac
E = 50 A = 199.3 Ac
ASSUMED BREACH WIDTH = 196 (.4) = 78.0'

79-90-10
MILL POND DAM
ESSEX CONN.

DKS 3-19-80
PB 3-20-80

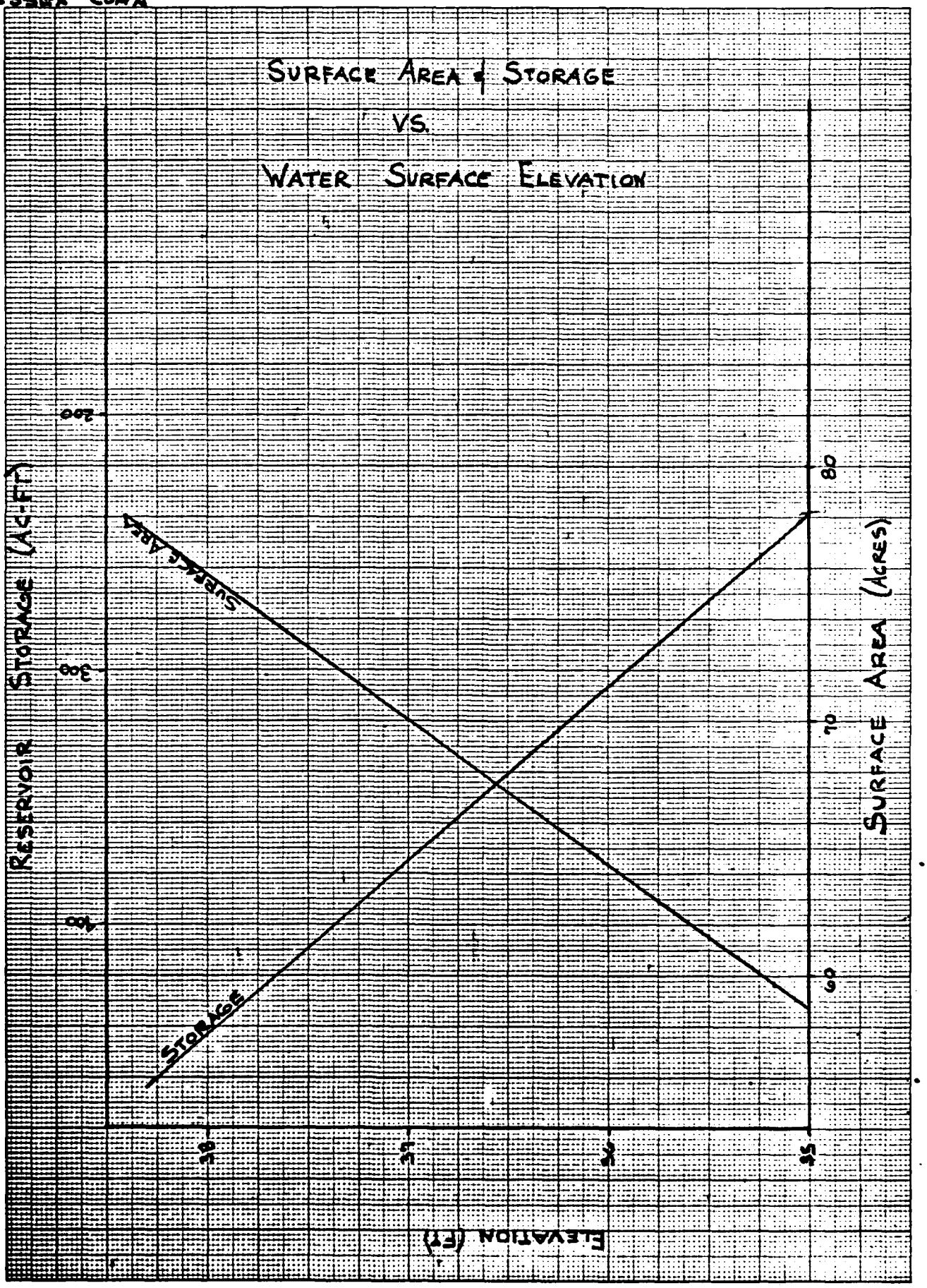


D-7

79 90 10
MILL POND DAM
ESSEX CONN

RAC 3-3-80
PB 3-20-80

SURFACE AREA & STORAGE VS. WATER SURFACE ELEVATION



D-8

PROJECT 4790 10
MILLPOND DAM
ESSEX CONN

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. _____ OF _____
BY RAC DATE 3-21-8
CHK'D. BY DFB DATE 3-21-81

HSE	BASE FLOW WATER ELEV	FLOOD WAVE Water ELEV	FIRST FL HSE ELEV	BASE FLOW Water Depth	FLOOD WAVE Water Depth
1	28.4	33.6	32	0	1.6
2	27.9	33.5	30	0.9	3.5
3	27.1	33.2	32	0	1.2
4	27.1	33.2	32	0	1.2
5	26.3	32.8	32	0	0.8
6	25.5	32.5	30	0	2.5
7	25.5	32.5	31	0	1.5
8		24.5	22	0	2.5

0-1	1 HOUSE
1-2	4 HOUSES
2-3	2 HOUSES
3-4	1 HOUSE

MILL POND DAM

79-90-1 DKS 3/19/80
CK. PB 3/20/80

FGA FLOOD WAVE ROUTING

APPROXIMATE FLOOD WAVE ROUTING BASED UPON U.S. ARMY CORPS OF ENGINEERS' "RULE OF THUMB GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS" DATED APRIL, 1978.

INITIAL STATION = 0 +0
INITIAL BASE FLOW = 1,223 CFS
INITIAL WAVE HEIGHT = 18.0 FT
ASSUMED BREACH WIDTH = 80.0 FT
INITIAL RESERVOIR STORAGE = 464 ACRE-FT
COMPUTED FLOOD WAVE PEAK FLOW = 10,265 CFS
TOTAL FLOOD WAVE PEAK FLOW = 11,488CFS

STATION 0+20

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-2250.0 FT	70.0 FT	-2020.0 FT	50.0 FT	-100.0 FT	40.0 FT
-15.0 FT	40.0 FT				
		N = 0.040			
-15.0 FT	40.0 FT	-10.0 FT	35.0 FT	10.0 FT	35.0 FT
15.0 FT	40.0 FT				
		N = 0.080			
15.0 FT	40.0 FT	230.0 FT	40.0 FT	490.0 FT	50.0 FT
600.0 FT	60.0 FT	1000.0 FT	60.0 FT		

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
168.0 SF	267.8 FT	0.050	10.8 FPS	1,830CFS
153.5 SF	34.1 FT	0.040	50.6 FPS	7,773CFS
216.5 SF	239.7 FT	0.080	8.6 FPS	1,879CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
35.0 FT	5.9 FT	40.9 FT	538 SF	21.3 FPS	11,483 CFS	0.2500

BASE FLOW = 1,223 CFS BASE STAGE = 37.0 FT.

STATION 5 +0

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-510.0 FT	50.0 FT	-370.0 FT	40.0 FT	-130.0 FT	30.0 FT
-15.0 FT	30.0 FT				
		N = 0.040			
-15.0 FT	30.0 FT	-10.0 FT	25.0 FT	10.0 FT	25.0 FT
15.0 FT	30.0 FT				
		N = 0.080			
15.0 FT	30.0 FT	120.0 FT	50.0 FT	290.0 FT	70.0 FT
330.0 FT	80.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
662.6 SF	212.2 FT	0.050	9.1 FPS	6,095CFS
246.5 SF	34.1 FT	0.040	20.1 FPS	4,957CFS
43.0 SF	21.6 FT	0.080	4.2 FPS	183CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
25.0 FT	9.0 FT	34.0 FT	952 SF	11.8 FPS	11,236 CFS	0.0210

BASE FLOW = 1,223 CFS BASE STAGE = 29.2 FT.

STATION 15+90

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-2910.0 FT	100.0 FT	-2710.0 FT	50.0 FT	-230.0 FT	40.0 FT
-90.0 FT	30.0 FT	-20.0 FT	20.0 FT	-10.0 FT	20.0 FT
		N = 0.040			
-10.0 FT	20.0 FT	-5.0 FT	18.0 FT	5.0 FT	18.0 FT
10.0 FT	20.0 FT				
		N = 0.080			
10.0 FT	20.0 FT	180.0 FT	50.0 FT	410.0 FT	60.0 FT
460.0 FT	70.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
606.3 SF	104.5 FT	0.050	7.4 FPS	4,504CFS
264.0 SF	20.7 FT	0.040	15.6 FPS	4,138CFS
387.9 SF	67.3 FT	0.080	4.6 FPS	1,793CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
18.0 FT	13.7 FT	31.7 FT	1,258 SF	8.2 FPS	10,436 CFS	0.0060

BASE FLOW = 1,223 CFS BASE STAGE = 23.5 FT.

STATION 31+20

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-1050.0 FT	70.0 FT	-820.0 FT	50.0 FT	-230.0 FT	40.0 FT
-150.0 FT	20.0 FT	-10.0 FT	20.0 FT		
		N = 0.040			
-10.0 FT	20.0 FT	-5.0 FT	17.0 FT	5.0 FT	17.0 FT
10.0 FT	20.0 FT				
		N = 0.080			
10.0 FT	20.0 FT	120.0 FT	20.0 FT	300.0 FT	40.0 FT
580.0 FT	40.0 FT	1160.0 FT	50.0 FT	1500.0 FT	100.0 FT

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
1,410.3 SF	176.8 FT	0.050	3.1 FPS	4,426CFS
223.6 SF	21.6 FT	0.040	4.6 FPS	1,042CFS
1,341.8 SF	190.8 FT	0.080	1.8 FPS	2,419CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
17.0 FT	11.9 FT	28.9 FT	2,975 SF	2.6 FPS	7,889 CFS	0.0007

BASE FLOW = 1,223 CFS BASE STAGE = 22.8 FT.

STATION 37+20

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-150.0 FT	40.0 FT	-100.0 FT	30.0 FT	-50.0 FT	20.0 FT
-10.0 FT	19.0 FT				
		N = 0.040			
-10.0 FT	19.0 FT	-5.0 FT	16.0 FT	5.0 FT	16.0 FT
10.0 FT	19.0 FT				
		N = 0.050			
10.0 FT	19.0 FT	200.0 FT	20.0 FT	250.0 FT	30.0 FT
350.0 FT	40.0 FT				

AREA	WETTED PERIMETER	N	VELOCITY	FLOW
336.5 SF	69.6 FT	0.050	3.5 FPS	1,179CFS
181.1 SF	21.6 FT	0.040	6.3 FPS	1,143CFS
1,282.6 SF	219.6 FT	0.050	3.9 FPS	5,097CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
16.0 FT	9.8 FT	25.8 FT	1,800 SF	4.1 FPS	7,419 CFS	0.0017

BASE FLOW = 1,223 CFS BASE STAGE = 21.4 FT.

STATION 54+20

OFFSET	ELEV.	OFFSET	ELEV.	OFFSET	ELEV.
		N = 0.050			
-800.0 FT	30.0 FT	-75.0 FT	20.0 FT	-10.0 FT	20.0 FT
		N = 0.040			
-10.0 FT	20.0 FT	-5.0 FT	15.0 FT	5.0 FT	15.0 FT
10.0 FT	20.0 FT				
		N = 0.050			
10.0 FT	20.0 FT	75.0 FT	20.0 FT	350.0 FT	20.0 FT
700.0 FT	30.0 FT				

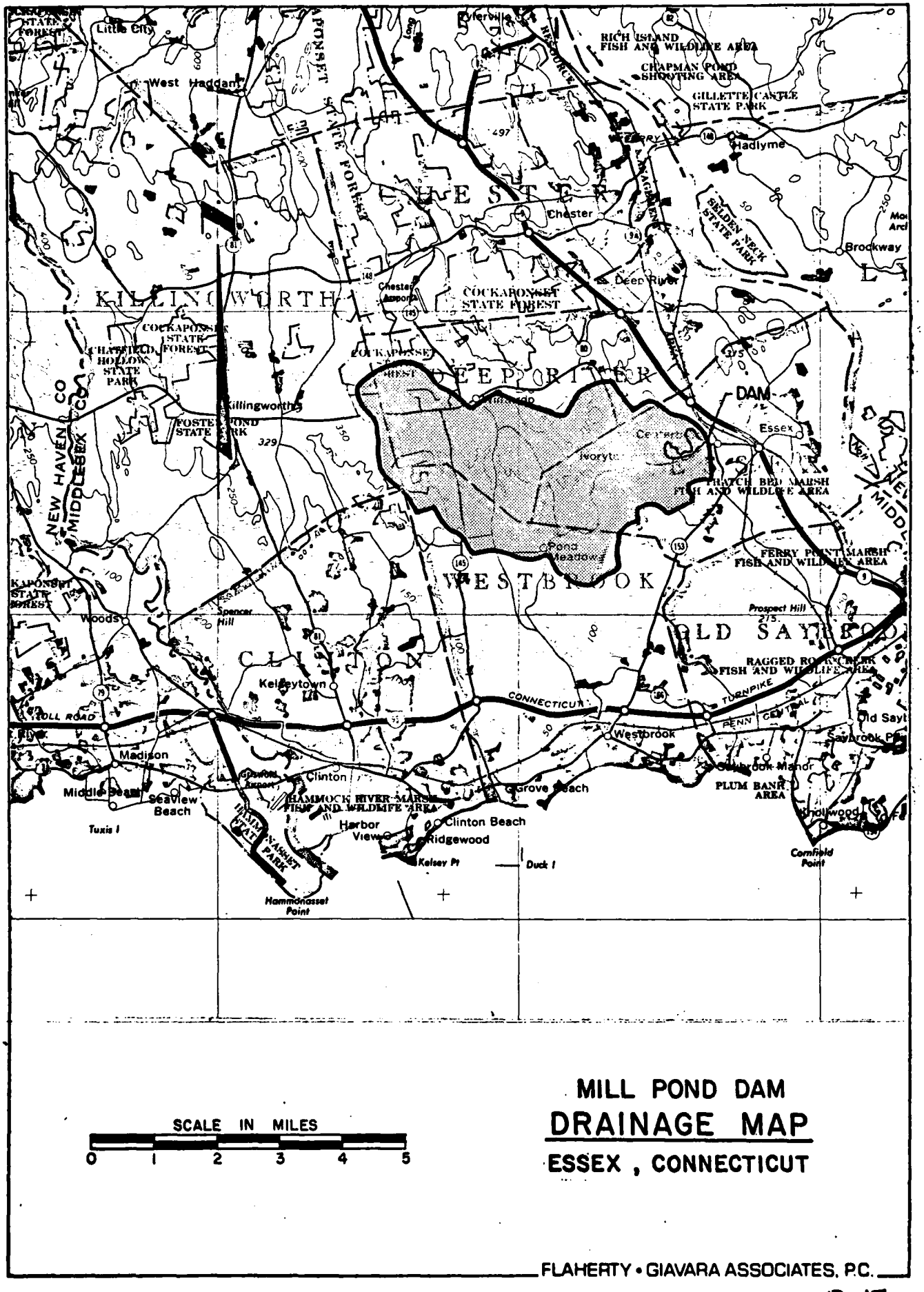
AREA	WETTED PERIMETER	N	VELOCITY	FLOW
1,028.1 SF	391.5 FT	0.050	1.3 FPS	1,424CFS
165.0 SF	24.1 FT	0.040	3.2 FPS	541CFS
1,886.3 SF	497.7 FT	0.050	1.7 FPS	3,338CFS

INVERT	DEPTH	W. SURFACE	AREA	VELOCITY	FLOW	SLOPE
15.0 FT	9.5 FT	24.5 FT	3,079 SF	1.7 FPS	5,304 CFS	0.0006

MILL POND 1 DAM 79-90-10 FLOOD ROUTING DKS MARCH 19
1/2 PMF cc. PB 3/20/80

INPUT DATA: UNSUBMERGED WEIR
SEGMENT 1 DISCHARGE COEFFICIENT = 3 LENGTH OF WEIR = 101 ELEVATION OF WEIR = 38.3
SEGMENT 2 DISCHARGE COEFFICIENT = 3 LENGTH OF WEIR = 68 ELEVATION OF WEIR = 35
IE= 35.0 IV= 0.0 E= 35.0 A= 58.80 E= 40.0 A= 87.20 E= 50.0 A=199.30

HOUR	INFLOW	MASS INFLOW	WATER EL.	TAIL WATER	OUTFLOW	MASS OUTFLOW	STORAGE(R)	STORAGE(A)
0.00	0CFS	0.00AC-F	35.00FT	.00FT	0CFS	0.00AC-F	0.00AC-F	0.00AC-F
1.00	2,009CFS	83.01AC-F	36.16FT	0.00FT	256CFS	10.61AC-F	72.40AC-F	72.40AC-F
2.00	4,018CFS	332.06AC-F	38.62FT	0.00FT	1,463CFS	81.68AC-F	250.38AC-F	250.38AC-F
3.00	6,027CFS	747.14AC-F	40.79FT	0.00FT	4,041CFS	309.16AC-F	437.98AC-F	437.98AC-F
4.00	8,036CFS	1,328.26AC-F	42.24FT	0.00FT	6,357CFS	738.89AC-F	589.36AC-F	589.36AC-F
4.50	9,040CFS	1,681.07AC-F	42.83FT	0.00FT	7,407CFS	1,023.31AC-F	657.76AC-F	657.76AC-F
5.00	8,538CFS	2,044.25AC-F	43.19FT	0.00FT	8,071CFS	1,343.14AC-F	701.11AC-F	701.11AC-F
6.00	7,534CFS	2,708.38AC-F	43.18FT	0.00FT	8,044CFS	2,009.08AC-F	699.30AC-F	699.30AC-F
7.00	6,529CFS	3,289.50AC-F	42.75FT	0.00FT	7,259CFS	2,641.44AC-F	648.05AC-F	648.05AC-F
8.00	5,525CFS	3,787.60AC-F	42.21FT	0.00FT	6,302CFS	3,201.83AC-F	585.76AC-F	585.76AC-F
9.00	4,520CFS	4,202.68AC-F	41.62FT	0.00FT	5,308CFS	3,681.64AC-F	521.04AC-F	521.04AC-F
10.00	3,516CFS	4,534.75AC-F	40.97FT	0.00FT	4,309CFS	4,079.09AC-F	455.65AC-F	455.65AC-F
11.00	2,511CFS	4,783.80AC-F	40.27FT	0.00FT	3,315CFS	4,394.19AC-F	389.60AC-F	389.60AC-F
12.00	1,507CFS	4,949.83AC-F	39.49FT	0.00FT	2,342CFS	4,627.98AC-F	321.85AC-F	321.85AC-F
13.00	502CFS	5,032.85AC-F	38.59FT	0.00FT	1,442CFS	4,784.39AC-F	248.45AC-F	248.45AC-F
13.50	0CFS	5,043.22AC-F	38.05FT	0.00FT	1,091CFS	4,836.75AC-F	206.46AC-F	206.46AC-F
15.00	0CFS	5,043.22AC-F	36.72FT	0.00FT	463CFS	4,933.13AC-F	110.08AC-F	110.08AC-F
20.00	0CFS	5,043.22AC-F	35.18FT	0.00FT	16CFS	5,032.23AC-F	10.98AC-F	10.98AC-F



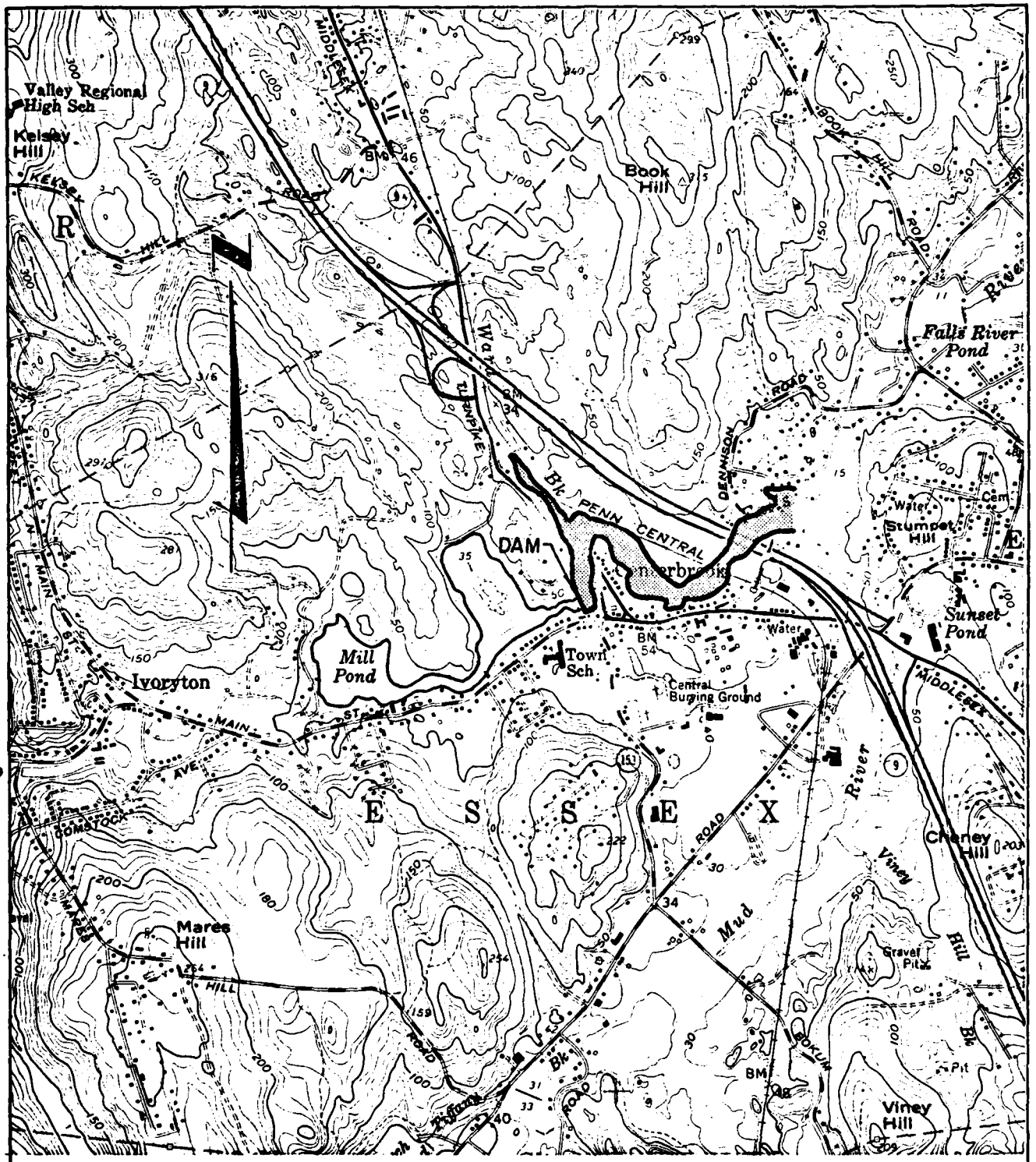
SCALE IN MILES

0 1 2 3 4 5

MILL POND DAM
DRAINAGE MAP
ESSEX , CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

D-17



IMPACT AREA

SCALE IN FEET

2000 1000 0 2000

MILL POND DAM
DAM FAILURE ANALYSIS
IMPACT AREAS
ESSEX , CONNECTICUT

FLAHERTY • GIAVARA ASSOCIATES, P.C.

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

END

FILMED

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